Technical Specification of fully automatic instrument transformers (CT) test bench

1. Objective:

The system itself contented and include all the requirement of power control to generate test current for the appropriate reference CTs. All the control are provided on the front panel of cabinet and all the connections for CT specimen are made on the rear of the cabinet. The rear endof cabinet can be fenced of the safety purposes. Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard IEC-60044 and Indian Standards IS 2705 (Current Transformer) and IS 16227 on current transformers in the laboratory.

2. Details of CT Testing system (Test Bench)

2.1(a).CT- testing System

An automatic Instrument Transformer Test Set having the following items-

1. Control panel with regulating unit.
2. Current generation up to **4000A**.
3. Standard current transformer **2000A**. (Max 200% In)
4. Standard current burden
5. Measuring bridge (comparator) for current
6. CT Demagnetizer
7. Cable for primary and secondary connection of CT
8. Computer system & software (support software/ MS office Antivirus of Associated Computer system has to be supplied separately for each test system.
9. Documents (drawing, operating manual, Factory calibration certificates)
10. Training to at least 5 personnel from the department on all aspects of operation and maintenance.
11. Continued technical support during warranty period for five years.

2.2. General Operating Conditions CT test bench

Input supply voltage	3X240V, 3Ph 4W,
50Hz.Frequency	50Hz
Temperature range	23°C–± 10°Cin the room where the transformer under test is suited. Humidity not higher than 80% at 25°C not condensing

Pollution of the environment- it is not allowed that chemical substance causing corrosion influence to be precipitated.

2.3. Constructional features for current transformer test bench

All components for instrument current transformer testing shall be provided as below.

1. Voltage regulating transformer (used for current transformer testing both)

The current transformer test system shall consist following Components:

1. Current Generating Transformer.
2. Standard Current Transformer.
3. Standard Current burden
4. Current measuring bridge (comparator)
5. CT demagnetizer

2.4 Current Generation unit

Technical details are as follows

Current generation	**4000A** (< 5 min)
Power rating	**8 KVA**
Input voltage	variable from 0 to 240V P-N (supplied by the regulating unit)Generating unit must haveshort time rating of **4000 A** (<5 min)

2.5 Standard Current Transformer

Nominal Primary current ranges:-

4000,3500,3200,3100,3000,2800,2750,2700,2600,2500,2400,2300,2200,2000, 1800,1750,1700,1600,1500,1400,1300,1250,1200,1000,900,800,750,700,600,500, 400,300,250,225,200,175,150,125,100,75,60,50,40,30,25,20,15,12.5,10,7.5,5.

Secondary current(I_n)	1A & 5A (both 1A and 5A terminals shall be separate)
Maximum current	200% of I_n
Accuracy	- **0.005%** ratio error (range 1% to 200% of I_n) at appropriate VA orBetter
Phase angle error δ≤±	1min at appropriate VA
Frequency	50 Hz

Calibration certificate of Standard CT must be enclosed with the bid. Calibration must be donefor 1A and 5A separate terminals and certificate shall be enclosed with the bid.

2.6 Standard Current Burden

The Current Transformer Burdens include:

The Current Transformer burden shall as per IS/ IEC (61869-2) **5 ampere**, 50 Hz. They are rated at 3.75, 2.5, 1.875, 1.25 & 1VA at 1.0 power factor and 5VA to 88.75 VA at 0.8 power factor with steps 5, 6.25,7.5, 10, 15, 30,40 upto 88.75 VA.

The Current Transformer burden shall as per IS/ IEC (61869-2) **1 ampere**, 50 Hz. They are rated at 3.75, 2.5, 1.875, 1.25 & 1VA at 1.0 power factor and 5VA to 88.75 VA at 0.8 power factor with steps 5, 6.25,7.5, 10, 15, 30,40 upto 88.75 VA.

Current transformer burdens are rated for continuous operation and are rated for 200% rating shorttime current.

Bidder shall provide switch type current burden for each burden step to have better stability of the selected burden.

2.7 CT Demagnetizer:- CT demagnetizer is provide within the test system. The demagnetizer is suitable for demagnetizing CTs of all ratios having either 5 or 1 Ampère Secondary windings.

2.8 Measuring Bridge Comparator for Current measurement

Separate bridges for Current transformer testing bench shall be provided. The specificationof measuring bridges shall be as under:

2.8.1 Measuring bridge for Current transformer testing

The Current measuring bridge shall be rack mounted type. Technical details are as follows:

- Controlling by Inbuilt front touch display and by PC software shall also be possible.
- Built in programmable divider to match the CT ratio which are not available in the standard current transformer, value of divider 0.9 to 1.
- Shall be able to calculate the **ratio and phase angle error** and data shall be available on the PC.

- Input Power Supply : 85-265V, 47-63Hz.
- Nominal current : 5A and 1A
- Matching (divider) : 0.9-1
- Working range : 1mA - 15 A
- Accuracy of ratio measurement : <±50 ppm (50mA-15A)
  : < ±100 ppm (<50mA-5mA)
- Accuracy of phase angle measurement : <±0.2 min (50mA-.15A)
  : < ±0.5 min (<50mA-..5mA)
- Relative Humidity (Not Condensing) : Max. 95%

2.9 Test-

The following tests are to be conduct on Fully Automatic instrument Transformer Testingbench:

1. Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard-IEC 60044 and Indian Standards IS 2705 and IS 16227 on current transformers in the laboratory.
   1. Verification of Terminal Marking polarity
   2. Power Frequency Dry withstand Tests on Secondary winding
   3. Over voltage inter-turn Test
   4. Determination of error or other Characteristics according to the requirement of the appropriate designation or accuracy class

5. Insulation Resistance Test

2.10 Connecting Cables & accessories for CT Test bench

(a) For the CT test, the supplier shall deliver the appropriate cables used for:

- Connecting cables between the measuring bridge and the secondary sides of thetransformer and the transformers under test.
- Connecting cables between the Current Burden and secondary side of Transformer undertest through measuring bridge.
- The test system shall contain also high current cables to connect the primary side of CT under test and Standard CT from Current generating unit: 2 x 2 m for the maximum current **4000 A**.

2.11 Data handling and recording :

- **Test Report Generation:-** Test reports can be saved /stored on computer system and transferred to a Portal of BESCOM. Data and protocols can be shown on a PC via the Excel customizable reports templates shall be available for different standards and as per IS 17025:2017 for Test Report, Classes and Applications, Single, multi core and multi tap CTs.

2.12 Technical Specification of Computer System with Printer:-
(should be from known reputed brand)

1. **System Feature**
   a. Operating System : Windows 11.
   b. Processor : i7 14th generation, 3.6 GHz ; Brand Intel
   c. Chipset Mobile HM 76 Express
   d. Cache 3MB or higher
2. **Memory a) System Memory :** 16 GB DDR 4 or higher
3. **Storage a) Hard drives space :** At least 1TB SSD or higher , 7200 rpm
4. **Display** a) Screen size 21 inch with LCD Colour Monitor
5. **Optical Drive:** DVD/CDRW combo driver or better
6. **Port:** a) 3X USB 3.1 port , 2 X USB 3.0 port
   b) At least 1 RJ45 or better
   c) RS232 port (9 pin serial) / External USB to serial MOXA convertor
7. **Printer cum scanner:** Black and White with scanner and photocopier, suitable for papersize upto A4.
8. **Keyboard:** PS2/USB Multimedia/107 keys keyboard or better.
9. **Audio integrated digital microphone with speakerNetwork interface-** Ethernet, wireless LAN, Bluetooth
10. **Dimension and weight:-Should be light weight and portable**
11. **Power Supply a) 230 V AC, 50 Hz, 90 W (not more than) AC Adaptor**
12. **Computer UPS- 2KV (Portable)**
13. **Software CD**
    a) Product Support software
    b) MS Office Standard

c) Reputed brand Anti-virus software with three years validity

2.13 Safety Aspect

- Overload protection on line and regulator. Zero Start indication for safety and Safety interlock switch for HV barrier with HV indicator lamp shall be provided by supplier.
- Since the above mentioned equipment deals with high voltage supplier shall take care the safety aspect during design, manufacturing. Supplier shall provide the safety instruction to operator and clearly labelled on the equipment.
- Supplier shall provide emergency switch connection which shall be mounted on the Power supply unit to cut off the supply in case of emergency. Also supplier shall provide necessary barricading to avoid accidental entry of any person in the testing area.
- There shall be facility to provide emergency stop by limit switch mount on the door ofthe high voltage area.
- During tests regulations for safety operation should be observed, acc. to IEC61010.
- Supplier shall provide one voltage annunciating device for operator which beep whenoperator is near to high voltage area.

2.14 Demonstration & Commissioning:

a) During the inspection at factory premise bidder shall demonstrate the asked features on the offered test bench as per tender specification. A designated team from the BESCOM shall evaluate the technical capability of the test bench at the bidders works in India. If bidder is not able to demonstrate the features, the bid of aforesaid bidder shall be rejected. It is the responsibility of the bidder to demonstrate all the Instruments with necessary software and accessories required to show the performance of the test set as per technical Specification at date and time communicated to them in advance.

The bidders are also required to provide the operating manual /required literature and send competent Engineers at that. The purchaser will evaluate the suitability of product of their application. The purchaser decisions will be final and unchanged for acceptance/ not-acceptance of product even, ifthe product will be comply other tender terms.

b) The supplier shall have to commission the instrument at consignee" premises as desired by the consignee's signee staff shall be desired by the consignee. Necessary Standard Tests shall be done at consingee's the premises during the commissioning of the Instrument. The consignee's staff shall be trained by the manufacture's Engineer for satisfactory operation, maintenance andtroubleshooting upto their full satisfaction.

2.15 Marking and Nameplate:

Each test bench shall have the following details:-

a. Name of Manufacturer
b. Year of manufacture

c. Serial no
d. Property of BESCOM
e. Rating and accuracy class on (along with the calibration stickers).

2.16 **General Conditions:** The CT testing systems (Test Benches) are called for 5 years warranty at site from the date of commission. During the warranty period any breakdown calls/ email will be attended within 2days of receipt of intimation (except long weekends/ holidays). The repair/ rectification will be carried out free of charge at no cost implication to BESCOM. Individual components / modules will be rectified and made operational.

Technical Specification of fully automatic instrument transformers (PT) test bench

1. Objective:

The system itself contented and include all the requirement of power control to generate test voltage& current for the appropriate reference VTs. All the control are provided on the front panel of cabinet and all the connections for CT specimen/ VT are made on the rear of the cabinet. The rear end of cabinet can be fenced of the safety purposes.
Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard IEC-60044 and Indian Standards IS 3156 (Voltage Transformer) and IS 16227 on voltage transformers in the laboratory.

1. Details of PT Testing system (Test Bench)

1.1 PT- testing System

An automatic Instrument Transformer Test Set having the following items-

1. Control panel with regulating unit.
2. Measuring bridge (comparator) for voltage
3. Three Phase High voltage generation unit 63 KV.
4. Standard Voltage transformer 33KV.
5. Standard voltage burden.
6. Single Phase High Voltage Breakdown tester (0-100 KV) test Kit
7. AC High Voltage Test unit 0-5 KV AC
8. Digital Insulation Tester
9. Cable for primary and secondary connection of CT & VT
10. Computer system & software (support software/ MS office Antivirus of Associated Computer system has to be supplied separately for each test system.
11. Documents (drawing, operating manual, Factory calibration certificates).
12. Training to at least 5 personnel from the department on all aspects of operation and maintenance.
13. Continued technical support during warranty period for five years.

1.2 General Operating Conditions PT test bench

Input supply voltage	3X240V, 3Ph 4W,
50Hz.Frequency	50Hz
Temperature range	23°C-± 10°Cin the room where the transformer under test is suited. Humidity not higher than 80% at 25°C not condensing

Pollution of the environment- it is not allowed that chemical substance causing corrosion influence to be precipitated.

1.3 **Constructional features for voltage transformer test bench**

All components for instrument voltage transformer testing shall be provided as below.

a) Voltage regulating transformer (used for voltage transformer testing.

b) **The voltage transformer test system shall consist following Components:**

1. High voltage generating transformer.
2. Standard voltage transformer 33 KV.
3. Standard voltage transformer 63 KV
4. Standard voltage burden
5. Voltage measuring bridge (Common comparator)

Tools and accessories like clamps, secondary cables etc. shall be provided

The high voltage system shall have three phase high voltage rail arrangement for lab maintaining suitable height with proper insulator. The arrangement shall be made in such a way that Voltage generated from high voltage generation unit shall be fed to High voltage rail and Voltage for standard voltage transformer and Transformer under test shall be tapped using spiral cable. The high voltage rail shall be having an arrangement for grounding switch which shall grounded the high voltage rail once testing is over.

Detailed general arrangement drawing of high voltage rail arrangement shall be provided.

1.4 **Measuring Bridge Comparator for Voltage measurement**

Separate bridges for Current and voltage transformer testing bench shall be provided. The specification of measuring bridges shall be as under:

1.5 **Measuring bridge for voltage transformer testing**

The voltage measuring bridge shall be rack mounted type. Technical details are as follows:

- Controlling by front inbuilt touch display and by PC software shall also be possible.
- Shall be able to calculate the **ratio and phase angle error** and data shall be available on the PC.
- Built in programmable divider to match the VT ratio which are not available in the standard voltage transformer, value of divider 0.9 to 1

- Input Power Supply : 85-265V, 47-63Hz.
- Voltage Range : 2V-440V
- Matching (divider) : 0.9-1
- Accuracy of ratio measurement : < ±50 ppm (10V-500V)
  : < ±100 ppm (2V-<10V)
- Accuracy of phase measurement : < ±0.2 Min (10V-500V)
  : < ±0.5 Min (2V-<10V)
- Relative Humidity (Not Condensing) : Max. 95%

1.6 **Three Phase High voltage Generating Transformer unit (0-63 KV)**

Generation of high voltage source for accuracy testing of VTs technical details are as follows.

Primary voltage : 3ph, 4 W, 415V Ph-Ph

Frequency voltage : 50Hz

Secondary voltage : 0-63KV

Output Power max : 7.5 KVA or better capacity which is suitable

3phase high voltage oil cool transformer with control desk

1.7 **Standard Voltage transformer**

With the voltage ranges

- U_{Nprim} : 22-63kV
- U_{Nsec} : 110V
- Load range : 80 - 190 % UN
- Secondary burden : Appropriate burden
- Accuracy over the range : 80-190 % UN
- Voltage error : ±0.05 %
- Angle error δ : ± 2 Min
- Frequency : 50 Hz

Another standard voltage transformer with the voltage ranges

- U_{Nprim} : 6.6-21kV
- U_{Nsec} : 110V
- Load range : 80 - 190 % UN
- Secondary burden : Appropriate burden
  Accuracy over the range : 80-190 % UN
- Voltage error : ±0.05 %
- Angle error δ : ± 2 Min
- Frequency : 50 Hz

1.8 **Standard Voltage Burden**

The potential voltage burden shall include Potential transformer burden IS 16227/ IEC 61869-3,

1. Rated input voltage:- 110V and 63.5V
2. Frequency:-50 Hz
3. Burden Element Rating: - 1.25,2.5, 3.75, 5, 6.25, 7.5, 10, 12.5, 15, 18.75, 25, 30,37.5, 40,50, 75, 100 VA at 0.8 Power Factor and 1, 1.25, 2.5, 5, 10VA at 1.0 Power Factor.
4. The Potential transformer Burdens shall be rated for continuous operation and arerated for 190%rating on rated connected burden for short term rated voltage.

Switch type burdens shall be provided for three phase combined PT testing

to connect appropriate burden for other two phases which are not under testing.

1.9 **Single Phase High Voltage Breakdown tester (0-100 KV)** test Kit

PT is one of the critical safety valve of electrical metering system. The scope of supply will have suitable HV output range, Output voltage 0 to 100 KV. The equipment will have the provision of various high voltage ranges with digital display of current and voltage along with Programmable Timer Adjustable for 0-999 seconds with digital display & Input voltage 230V±10%, 50 Hz. The complete system shall have self- protection against the shock, flash over etc.

The equipment should be suitably designed for operation for testing PT at following parameter:-

Input Supply Voltage	230V±10 %, 50Hz,
Temperature range	Operation 0°Cto 40° C Storage 0° C to 60°C
Humidity	Operation: 90% RH at 40° C Storage : 93% RH at 40° C
Safety	The test set will have to meet the requirement of IS standard with latest amendment thereof.
Leakage Current in mA	20, 30, 100
Circuit breaker along with fuse system (relay)	With appropriate rating of relay shall beprovided for breaking the circuit.(max 100mA)
Output Supply Voltage	0 to 100KV
Accuracy	Accuracy for KV meter ± 1.5% and ±0.5% for mA
Display	LED/LCD display
Digital Timer With keypad programmable	0-999 sec with resolution of 0.01sec
Additional Features	Features: • Audio and Visual Alarm when HV ON and Off • Test ON and OFF Switch to Start and Interrupt Test • Precise Trip Current Setting of Press to set Switch for Leakage Current

1.10 **AC High Voltage Test Unit 0-5 KV**

Output Voltage (AC) - 0-5 KV
Test Current - 30mA , 50mA & 100mA
Current Limit - Settable from 10% to 100 % through continuously variable control
Meter - Two Digital meters to monitor voltage & leakage Current
Accuracy - ±1 % of Reading

Least Count	- 0-2.5KV=0.05 KV,0-5 KV= 0.1 KV
Power requirement	- 230 V AC
Timer	- 3 Digit, setable from 0-999 sec

1.11 Digital Insulation Tester:

Test Voltage	250V-5KV
Resistance Range	10TΩ
Accuracy	5% up to 1TΩ 20% up to 10TΩ
Short ckt current	3mA/5mA
Test Modes	IR,DAR,PI,
Capacitance	10nF to 25μF
Accuracy	10% ± 5 nF
IP Rating	IP65
CAT IV	CAT IV600V
PC Interface	USB,RS232
Software	Yes
Power supply	Mains/Battery
Battery	Li-Ion
Calibration Certificate	Shall be provided

RS 232 serial port/ USB/Ethernet shall be able to communicate with System.

2.12 Test-

The following tests are to be conduct on Fully Automatic instrument Transformer Testingbench:

1. Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard-IEC 60044 and Indian Standards IS 3156 (Voltage Transformer) and IS 16227 on voltage transformers in the laboratory.
   - Verification of Terminal Marking polarity
   - Power Frequency Dry withstand Tests on Secondary winding
   - Over voltage inter-turn Test
   - Determination of error or other Characteristics according to the requirement of the appropriate designation or accuracy class
   - Insulation Resistance Test

2.13 Connecting Cables & accessories for PT Test benches

a) **For the PT test, the supplier shall deliver the appropriate cables used for:**

- Connecting cables between the measuring bridge and the secondary sides of thetransformer and the transformers under test.
- Connecting cables between Voltage Burden and secondary side of the transformer under test. Connecting cables between the primary sides of SVT & VT under test and the secondary sides of the high voltage generating transformers for test voltage.
- High voltage rail arrangement as mentioned vide clause no. 2.3
- The equipment is intended to be wired to a 3 Phase, 440 (ph- ph)V source with neutral capable of supplying 50A. It comes complete with a 5 meter, four-wire power Cable for this purpose
- The equipment includes all the typical leads required to Connect CTs or

PTs and conducttests. Such leads include the following:

- VT secondary leads, 4 conductor arrangement for avoiding lead drop in the test set up (10meters).
- VT primary leads (2 x 1 meters).
- Test CT burden measurement leads of 3 meters. Test CT secondary cable of 3 meters.
- 6 nos. of 120 Sq. mm cable of 400 each for CT
- Primary connection.
- Clamps for fastening primary connections.
- Holes are provided in Bus-bar to connect the Primary cables.
- Safety switch.

2.14 Data handling and recording :

- **Test Report Generation:-** Test reports can be saved /stored on computer system and transferred to a Portal of BESCOM. Data and protocols can be shown on a PC via the Excel customizable reports templates shall be available for different standards and as per IS 17025:2017 for Test Report, Classes and Applications, Single, multi core and multi tap CTs.

2.15 Technical Specification of Computer System with Printer:-
(should be from known reputed brand)

1. **System Feature**
   a. Operating System : Windows 11.
   b. Processor : i7 14th generation, 3.6 GHz ; Brand Intel
   c. Chipset Mobile HM 76 Express
   d. Cache 3MB or higher
2. **Memory a) System Memory :** 16 GB DDR 4 or higher
3. **Storage a) Hard drives space :** At least 1TB SSD or higher , 7200 rpm
4. **Display** a) Screen size 21 inch with LCD Colour Monitor
5. **Optical Drive:** DVD/CDRW combo driver or better
6. **Port:** a) 3X USB 3.1 port , 2 X USB 3.0 port
   d) At least 1 RJ45 or better
   e) RS232 port (9 pin serial) / External USB to serial MOXA convertor
7. **Printer cum scanner:** Black and White with scanner and photocopier, suitable for papersize upto A4.
8. **Keyboard:** PS2/USB Multimedia/107 keys keyboard or better.
9. **Audio integrated digital microphone with speaker Network interface-** Ethernet, wireless LAN, Bluetooth
10. **Dimension and weight:-Should be light weight and portable**
11. **Power Supply a) 230 V AC, 50 Hz, 90 W (not more than) AC Adaptor**
12. **Computer UPS- 2KV (Portable)**
13. **Software CD**
    a) Product Support software
    b) MS Office Standard
    c) Reputed brand Anti-virus software with three years validity

2.16 Safety Aspect

- Overload protection on line and regulator. Zero Start indication for safety and Safety interlock switch for HV barrier with HV indicator lamp shall be provided by supplier.
- Since the above mentioned equipment deals with high voltage supplier shall take care the safety aspect during design, manufacturing. Supplier shall provide the safety instruction to operator and clearly labelled on the equipment.
- Supplier shall provide emergency switch connection which shall be mounted on the Power supply unit to cut off the supply in case of emergency. Also supplier shall provide necessary barricading to avoid accidental entry of any person in the testing area.
- There shall be facility to provide emergency stop by limit switch mount on the door ofthe high voltage area.
- During tests regulations for safety operation should be observed, acc. to IEC61010.
- Supplier shall provide one voltage annunciating device for operator which beep whenoperator is near to high voltage area.

2.17 Demonstration & Commissioning:

1. During the inspection at factory premise bidder shall demonstrate the asked features on the offered test bench as per tender specification. A designated team from the BESCOM shall evaluate the technical capability of the test bench at the bidders works in India. If bidder is not able to demonstrate the features, the bid of aforesaid bidder shall be rejected. It is the responsibility of the bidder to demonstrate all the Instruments with necessary software and accessories required to show the performance of the test set as per technical Specification at date and time communicated to them in advance.

   The bidders are also required to provide the operating manual /required literature and send competent Engineers at that. The purchaser will evaluate the suitability of product of their application. The purchaser decisions will be final and unchanged for acceptance/ not-acceptance of product even, if the product will be comply other tender terms.
2. The supplier shall have to commission the instrument at consignee" premises as desired by the consignee's signee staff shall be desired by the consignee. Necessary Standard Tests shall be done at consingee's the premises during the commissioning of the Instrument. The consignee's staff shall be trained by the manufacture's Engineer for satisfactory operation, maintenance and troubleshooting upto their full satisfaction.

2.18 Marking and Nameplate:

Each test bench shall have the following details:-

a) Name of Manufacturer
b) Year of manufacture
c) Serial no
d) Property of BESCOM
e) Rating and accuracy class on (along with the calibration stickers).

2.19 General Conditions: The CT PT testing systems (Test Benches) are called for 5 years warranty at site from the date of commission. During the warranty period any breakdown calls/ email will be attended within 2days of receipt of intimation (except long weekends/ holidays). The repair/ rectification will be carried out free of charge at no cost implication to BESCOM. Individual components / modules will be rectified and made operational.

GUARANTEED TECHNICAL SPECIFICATION OF FULLY AUTOMATIC INSTRUMENTTRANSFORMER (CT) TEST SYSTEM

Sl. No.	Particulars	Offered
1.	**CT testing System** An automatic Instrument Transformer Test Set having the following items- 1. Control panel with regulating unit. 2. Current generation up to **4000A**. 3. Standard current transformer **2000A**. (Max 200% In) 4. Standard current burden 5. Measuring bridge (comparator) for current 6. CT Demagnetizer 7. Cable for primary and secondary connection of CT 8. Computer system & software (support software/ MS office Antivirus of Associated Computer system has to be supplied separately for each test system. 9. Documents (drawing, operating manual, Factory calibration certificates) 10. Training to at least 5 personnel from the department on all aspects of operation and maintenance. 11. Continued technical support during warranty period for five years.	
2	**General Operating Conditions Both CT test bench** Input supply voltage 3X240V, 3Ph 4W, 50Hz. Frequency 50Hz Temperature range 23°C ± 10°Cin the room where the transformer under test is suited. Humidity not higher than 80% at 25°C not condensing **Pollution of the environment-** it is not allowed that chemical substance causing corrosion influence to be precipitated.	
3.	**Constructional features for current transformer test bench** All components for instrument current transformer testing shall be provided as below. 1. Voltage regulating transformer (used for current transformer testing both) **The current transformer test system shall consist following Components:** 1. Current Generating Transformer. 2. Standard Current Transformer. 3. Standard Current burden 4. Current measuring bridge (comparator) 5. CT demagnetizer	

	Constructional features for current and voltage transformertest system All components for instrument voltage and current transformer testing shall be provided as below. 1. Voltage regulating transformer (used for voltage and current transformer testing both)	
	The current transformer test system shall consist following Components: 2. Current generating transformer. 3. Standard current transformer. 4. Standard current burden. 5. Current measuring bridge (comparator) 6. CT demagnetizer	
4	**Current Generation unit** Technical details are as follows Current generation **4000A** (< 5 min) Power rating **8 KVA** Input voltage variable from 0 to 240V P-N (supplied by the regulating unit)Generating unit must haveshort time rating of **4000 A** (<5 min)	
5	**Standard Current Transformer** Nominal Primary current ranges:- 4000,3500,3200,3100,3000,2800,2750,2700,2600,2500,2400,2300, 2200,2000,1800,1750,1700,1600,1500,1400,1300,1250,1200,1000,90 0,800,750,700,600,500,400,300,250,225,200,175,150,125,100,75,60,50 ,40,30,25,20,15,12.5,10,7.5,5. Secondary current(I_n) 1A & 5A (both 1A and 5A terminals shall be separate) Maximum current 200% of I_n Accuracy - **0.005%** ratio error (range 1% to 200% of I_n) at appropriate VA orBetter Phase angle error δ≤± 1min at appropriate VA Frequency 50 Hz Calibration certificate of Standard CT must be enclosed with the bid. Calibration must be donefor 1A and 5A separate terminals and certificate shall be enclosed with the bid without certificate the bid will be treated non responsive.	
6	**Standard Current Burden** The Current Transformer Burdens include: The Current Transformer burden shall as per IS/ IEC (61869-2) 5 ampere, 50 Hz. They are rated at 3.75, 2.5, 1.875, 1.25 & 1VA at 1.0 power factor and 5VA to 88.75 VA at 0.8 power factor with steps 5, 6.25,7.5, 10, 15,	

	30,40 upto 88.75 VA. The Current Transformer burden shall as per IS/ IEC (61869-2) 1 ampere, 50 Hz. They are rated at 3.75, 2.5, 1.875, 1.25 & 1VA at 1.0 power factor and 5VA to 88.75 VA at 0.8 power factor with steps 5, 6.25,7.5, 10, 15, 30,40 upto 88.75 VA. Current transformer burdens are rated for continuous operation and are rated for 200% rating shorttime current.	
7	**CT Demagnetizer:-** CT demagnetizer is provide within the test system. The demagnetizer is suitable for demagnetizing CTs of all ratios having either 5 or 1 Ampère Secondary windings.	
	Measuring Bridge Comparator for Current measurement Separate bridges for Current transformer testing bench shall be provided. The specification of measuring bridges shall be as under: **Measuring bridge for Current transformer testing** The Current measuring bridge shall be rack mounted type. Technical details are as follows: ➢ Controlling by Inbuilt front touch display and by PC software shall also be possible. ➢ Built in programmable divider to match the CT ratio which are not available in the standard current transformer, value of divider 0.9 to 1. ➢ Shall be able to calculate the **ratio and phase angle error** and data shall be available on the PC. ▪ Input Power Supply : 85-265V, 47-63Hz. ▪ Nominal current : 5A and 1A ▪ Matching (divider) : 0.9-1 ▪ Working range : 1mA - 15 A ▪ Accuracy of ratio measurement : <±50 ppm (50mA-15A) : < ±100 ppm (<50mA-5mA) ▪ Accuracy of phase angle measurement : <±0.2 min (50mA-.15A) : < ±0.5 min (<50mA-..5mA) ▪ Relative Humidity (Not Condensing) : Max. 95%	

8	**Test-** The following tests are to be conduct on Fully Automatic instrument Transformer Testingbench: Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard-IEC 60044 ◦ and Indian Standards IS 2705 and IS 16227 on current transformers in the laboratory. 1. Verification of Terminal Marking polarity 2. Power Frequency Dry withstand Tests on Secondary winding 3. Over voltage inter-turn Test 4. Determination of error or other Characteristics according to the requirement of the appropriate designation or accuracy class 5. Insulation Resistance Test	
9	**Connecting Cables & accessories for CT/PT Test System** **a) For the CT test, the supplier shall deliver the appropriate cables used for:** • Connecting cables between the measuring bridge and the secondary sides of the transformer and the transformers under test. • Connecting cables between the Current Burden and secondary side of Transformer under test through measuring bridge. • The test system shall contain also high current cables to connect the primary side of CT under test and Standard CT from Current generating unit: 2 x 2 m for the maximum current **4000 A**.	
10	**Data handling and recording :** **Test Report Generation:-** Test reports can be saved /stored on computer system and transferred to a Portal of DISCOM. Data and protocols can be shown on a PC via the Excel TM file loader program, customizable reports templates shall be available for different standards, Classes and Applications, Single, multi core and multi tap .	

11.	**Technical Specification of Computer System with Printer:-** (should be from known reputed brand) **1. System Feature** a) Operating System : Windows 11. b) Processor : i7 14th generation, 3.6 GHz ; Brand Intel c) Chipset Mobile HM 76 Express d) Cache 3MB or higher **2. Memory a) System Memory : 8GB DDR 3 or higher** **3. Storage a) Hard drives space : At least 2 TB or higher , 7200 rpm** **4. Display a) Screen size 21inch with LCD Colour Monitor** **5. DVD/CDRW combo driver or better** **6. Port: a) 3 X USB 2.0 port , 2 X USB 3.0 port** b) At least 1 RJ45 or better c) RS232 port (9 pin serial) / External USB to serial MOXA convertor **7. Printer cum scanner: Black and White with scanner and photocopier, suitable for paper size upto A4.** **8. Keyboard : PS2/USB Multimedia/107 keys keyboard or better.** **9. Audio integrated digital microphone with speaker Network interface-** Ethernet, wireless LAN, Bluetooth **10. Dimension and weight :-Should be light weight and portable** **11. Power Supply a) 230 V AC, 50 Hz, 90 W (not more than) AC Adaptor** **12. Computer UPS- 2KV(Portable)** **13. Software CD** a. Product Support software. b. MS Office Standard c. Reputed brand Anti-virus software with three years validity	

REMARKS:

(1) Even though if any features or parameters are not specifically covered in this GTP, but are essential for the satisfactory performance of the Fully Automatic Instrument Transformer Testing Bench as per the specification, are deemed to have been covered in the GTP.

Place: Bangalore

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GUARANTEED TECHNICAL SPECIFICATION OF FULLY AUTOMATIC INSTRUMENTTRANSFORMER (PT) TEST SYSTEM

Sl. No.	Particulars	Offered
1.	**PT- testing System** An automatic Instrument Transformer Test Set having the following items- 1. Control panel with regulating unit. 2. Measuring bridge (comparator) for voltage 3. Three Phase High voltage generation unit 63 KV. 4. Standard Voltage transformer 33KV. 5. Standard voltage burden. 6. Single Phase High Voltage Breakdown tester (0-100 KV) test Kit 7. AC High Voltage Test unit 0-5 KV AC 8. Digital Insulation Tester 9. Cable for primary and secondary connection of CT & VT 10. Computer system & software (support software/ MS office Antivirus of AssociatedComputer system has to be supplied separately for each test system. 11. Documents (drawing, operating manual, Factory calibration certificates). 12. Training to at least 5 personnel from the department on all aspects of operation and maintenance. 13. Continued technical support during warranty period for five years.	
2	**General Operating Conditions PT test bench** Input supply voltage 3X240V, 3Ph 4W, 50Hz.Frequency 50Hz Temperature range 23°C ± 10°Cin the room where the transformer under test is suited. Humidity not higher than 80% at 25°C not condensing **Pollution of the environment-** it is not allowed that chemical substance causing corrosion influence to be precipitated.	
3	**Constructional features for voltage transformer test bench** All components for instrument voltage transformer testing shall be provided as below. All components for instrument voltage transformer testing shall be provided as below.	

	1. Voltage regulating transformer (used for voltage transformer testing. **The voltage transformer test system shall consist following Components:** 1. High voltage generating transformer. 2. Standard voltage transformer 33 KV. 3. Standard voltage transformer 63 KV 4. Standard voltage burden 5. Voltage measuring bridge (Common comparator) Tools and accessories like clamps, secondary cables etc. shall be provided The high voltage system shall have three phase high voltage rail arrangement for lab maintaining suitable height with proper insulator. The arrangement shall be made in such a way that Voltage generated from high voltage generation unit shall be fed to High voltage rail and Voltage for standard voltage transformer and Transformer under test shall be tapped using spiral cable. The high voltage rail shall be having an arrangement for grounding switch which shall grounded the high voltage rail once testing is over. Detailed general arrangement drawing of high voltage rail arrangement shall be provided.	
	Measuring Bridge Comparator for Voltage measurement Separate bridges for Current and voltage transformer testing bench shall be provided. The specification of measuring bridges shall be as under:	
7.2	**Separate Measuring bridge for voltage transformer testing** The voltage measuring bridge shall be rack mounted type. Technical details are as follows Controlling by front inbuilt touch display and by PC software shall also be possible. Shall be able to calculate the ratio and phase angle error and data shall be available on the PC. Built in programmable divider to match the VT ratio which are not available in the standard voltage transformer, value of divider 0.9 to 1 Input Power Supply : 85-265V, 47-63Hz. Voltage Range : 2V-400V Matching (divider) : 0.9-1 Accuracy of ratio measurement : < ±50 ppm (10V-500V) : < ±100 ppm (2V-<10V) Accuracy of phase measurement: < ±0.2 Min (10V-500V) : < ±0.5 Min (2V-<10V) Relative Humidity (Not Condensing) : Max. 95%	

8.	**Three Phase High voltage Generating Transformer unit(0-63 KV)** • High Voltage generation Unit - 63 KV • Generation of high voltage source for accuracy testing of VTs technicaldetails are as follows. • Primary voltage : 3ph, 4 W,415V Ph-Ph Frequency voltage : 50Hz • Secondary voltage : 0-63KV • Output Power max : 7.5 KVA or suitable higher capacity	
9.	Standard Voltage TransformerWith the voltage ranges • U_{Nprim} : 22-33kV • U_{Nsec} : 110V • Load range : 80 - 190 % UN • Secondary burden : Appropriate burden • Accuracy over the range : 80-190 % UN • Voltage error : ±0.05% • Angle error : ± 2 Min • Frequency : 50 Hz	
	Another standard voltage transformer with the voltage ranges • U_{Nprim} : 6.6-11kV • U_{Nsec} : 110V • Load range : 80 - 190 % UN • Secondary burden : Appropriate burden • Accuracy over the range : 80-190 % UN Voltage error : ±0.05 % • Angle error : ± 2 Min • Frequency : 50 Hz	
10	**Standard Voltage Burden** The potential voltage burden shall include Potential transformer burden IS 16227/ IEC 61869-3, 1. Rated input voltage:- 110V and 63.5V 2. Frequency:-50 Hz 3. Burden Element Rating: - 1.25,2.5, 3.75, 5, 6.25, 7.5, 10, 12.5, 15, 18.75, 25, 30,37.5, 40,50, 75, 100 VA at 0.8 Power Factor and 1, 1.25, 2.5, 5, 10VA at 1.0 Power Factor. 4. The Potential transformer Burdens shall be rated for continuous operation and arerated for 190%rating on rated connected burden for short term rated voltage. Switch type burdens shall be provided for three phase combined PT testing to connect appropriate burden for other two phases which are not under testing.	
11	**Single Phase High Voltage breakdown tester** (0-100 KV) PT is one of the critical safety value of electrical metering system. The scope of supply will have suitable HV output range, Output voltage 0 to 100 KV. The equipment will have the provision of various high voltage ranges with digital display of current and voltage along with Programmable Timer Adjustable for 0-999 seconds with digital display & Input voltage 230V±10%, 50 Hz. The complete system shall have self-protection against the shock, flash over etc.	

The equipment should be suitably designed for operation for testing PT at following parameter:-

Input Supply Voltage	230V±10%, 50Hz,
Temperature range	Storage 0° C to 60 °C
Humidity	Operation: 90% RH at 40 C Storage : 93% RH at 40 C
Safety	The test set will have to meet the requirement of IS standard with latest amendment thereof.
Leakage Current in mA	20, 30, 100
Circuit Breaker along with fuse system (relay)	With appropriate rating of relay will be provided for breaking the circuit. (max 100mA)
Output Supply Voltage	0 to 100KV
Accuracy	Accuracy for KV meter ± 1.5% and ± 0.5% for mA
Display	LED/LCD display
Digital Timer with Keypad programmable	0-999 sec with resolution of 0.01sec
Additional Features	Features: Audio and Visual Alarm when HV ON and Off Test ON and OFF Switch to Start and Interrupt Test Precise Trip Current Setting of Press to set Switch for Leakage Current

12 **AC High Voltage Test Unit 0-5 KV**

Output Voltage (AC) - 0-5 KV
Test Current - 30mA , 50mA & 100mA
Current Limit - Settable from 10% to 100 % through continuously variable control
Meter - Two Digi meters to monitor voltage & leakage Current
Accuracy - ±1 % of Reading
Least Count - 0-2.5KV=0.05 KV,0-5 KV= 0.1 KV
Power requirement - 230 V AC
Timer - 3 Digit, setable from 0-999 sec

13 **Digital Insulation Tester:**

Test Voltage	250V-5KV Resistance
Range	
Accuracy	
	up to
Short ckt current	3mA/5mA
Test Modes	IR,DAR,PI,
Capacitance	10nF to 25μF
Accuracy	10%
IP Rating	IP65
CAT IV	CAT IV600V
PC Interface	USB,RS232

	Software Yes Power supply Mains/Battery Battery Li-Ion RS 232 serial port /USB/Ethernet shall be able to communicate with System.	
14	**Test-** The following tests are to be conduct on Fully Automatic instrument Transformer Testing bench: Instrument should be able to perform following Acceptance & Routine test automatically as per International Standard-IEC 60044 and Indian Standards IS 2705 (Current Transformer), IS 3156 (Voltage Transformer) and IS16227 on current and voltage transformers in the laboratory. 1. Verification of Terminal Marking polarity 2. Power Frequency Dry withstand Tests on Secondary winding 3. Over voltage inter-turn Test 4. Determination of error or other Characteristics according to the requirement of the appropriate designation or accuracy class 5. Insulation Resistance Test	
15	**Connecting Cables & accessories for PT Test System** 1) **For the PT test, the supplier shall deliver the appropriate cables used for:** • Connecting cables between the measuring bridge and the secondary sides of the transformer and the transformers under test. • Connecting cables between Voltage Burden and secondary side of the transformer under test. Connecting cables between the primary sides of SVT & VT under test and the secondary sides of the high voltage generating transformers for test voltage. • High voltage rail arrangement as mentioned vide clause no. 2.3 • The equipment is intended to be wired to a 3 Phase, 440V (Ph-Ph)V source with neutral capable of supplying 50A. It comes complete with a 5 meter, four-wire power Cable for this purpose. • The equipment includes all the typical leads required to Connect CTs or PTs and conduct tests. Such leads include the following:	
	• VT secondary leads, 4 conductor arrangement for Avoiding lead drop in the test set up (10 meters). • VT primary leads (2 x 1 meters). • Test CT burden measurement leads of 3 meters. Test CT secondary cable of 3 meters. • 6 nos. of 120 Sq. mm cable of 400A each for CT. • Primary connection. • Clamps for fastening primary connections. Holes are provided in Busbar to connect the. Primary cables. • Safety switch.	

16	**Data handling and recording :** **Test Report Generation:-** Test reports can be saved /stored on computer system and transferred to a Portal of DISCOM. Data and protocols can be shown on a PC via the Excel TM file loader program, customizable reports templates shall be available for different standards, Classes and Applications, Single, multi core and multi tap .	
17.	**Technical Specification of Computer System with Printer:-** (should be from known reputed brand) **1. System Feature** **a)** Operating System : Windows 11 professional **b)** Processor : I7 or better, 2.5 GHz ; Brand Intel **c)** Chipset Mobile HM 76 Express **d)** Cache 3MB or higher **2. Memory a) System Memory : 8GB DDR 3 or higher** **3. Storage a) Hard drives space : At least 2 TB or higher , 7200 rpm** **4. Display a) Screen size 21inch with LCD Colour Monitor** **5. DVD/CDRW combo driver or better** **6. Port: a) 3 X USB 2.0 port , 2 X USB 3.0 port** b. At least 1 RJ45 or better. c. RS232 port (9 pin serial) / External USB to serial MOXA convertor **7. Printer cum scanner: Black and White with scanner and photocopier, suitable for paper size upto A4.** **8. Keyboard : PS2/USB Multimedia/107 keys keyboard or better.** **9. Audio integrated digital microphone with speaker** **Network interface-** Ethernet, wireless LAN, Bluetooth **10. Dimension and weight :-Should be light weight and portable** **11. Power Supply a) 230 V AC, 50 Hz, 90 W (not more than) AC Adaptor** **12. Computer UPS- 2KV(Portable)** **13. Software CD** **a)** Product Support software **b)** MS Office Standard c) Reputed brand Anti-virus software with three years validity	

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